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ORIGINAL ARTICLE

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Identified opportunities for gamification in the elective primary fast-track total hip and knee arthroplasty journey: Secondary analysis of healthcare professionals' interviews

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Abstract

Aims and objectives: To identify opportunities for gamification in the elective primary fast-track total hip and knee arthroplasty journey in order to support patients' health-related behaviour.

Background: Gamification provides an opportunity to increase engagement in a given health behaviour and, eventually, the possibility of reaching improved outcomes through continued or consistent behaviour.

Design: A secondary analysis.

Methods: Semi-structured interviews were conducted with 20 healthcare professionals in a single joint-replacement centre in Finland during autumn 2018. NVivo software was used for deductive and inductive coding. The open codes were also calculated. The consolidated criteria for reporting qualitative research were followed.

Results: Gamification opportunities were identified related to six dimensions: *accomplishment*, *challenge*, *competition*, *guided*, *playfulness* and *social experience*. Based on the frequencies of the coded content, most opportunities for gamification can be identified in the context of personalised counselling, monitoring and social support.

Conclusions: Several opportunities for gamification were identified and quantified. While various needs and limitations need to be considered when developing digital gamified solutions and more research into the effectiveness of such solutions will be required, the current study opens possible future avenues for exploring the use of gamification in lower limb joint replacement journey and other specialisms.

Relevance to clinical practice: This study provides an important insight into healthcare professionals' views of the current state of the total hip and knee arthroplasty journey and the potential for its development. In addition, it pinpoints the biggest opportunities for gamified services in the context of personalised counselling, monitoring and social support. Despite the focus of this secondary analysis being on the arthroplasty journey, the findings can also be generalised in other surgical journeys.

KEYWORDS
arthroplasty, gamification, patient journey

1 | INTRODUCTION

Arthroplasty is one of the most common orthopaedic surgeries performed to treat patients with end-stage osteoarthritis by providing improved function (Price et al., 2010), reduced pain and enhanced health-related quality of life while being cost-effective (Dakin, Gray, Fitzpatrick, MacLennan, Murray, 2012). In the next 10–20 years, the number of total knee arthroplasty (TKA) and total hip arthroplasty (THA) operations are predicted to increase considerably, not only due to the ageing population, but also due to increasing numbers of lower-limb joint replacements being conducted on patients younger than 60 years old (Culliford et al., 2015; Kurtz, Ong, Lau, Mowat, & Halpern, 2007).

During the past decade, the average length of stay (LOS) in hospitals has halved (Barad, Howell, & Tom, 2015; Wolford, Palso, & Bercovitz, 2015). Consequently, there is a need for advanced care in order to increase patients' engagement in a given health behaviour and decrease preoperative risk factors (e.g. nutrition, general health and medication, low physical activity, smoking and alcohol consumption), which are associated with adverse events and a prolonged LOS (Hansen, Bredtoft, & Larsen, 2012). Furthermore, in order to improve the management of their situation, the patients need to be more involved in their care at home after discharge.

This secondary analysis is a part of a larger R&D project that co-develops a digital patient journey solution into an elective primary fast-track THA/TKA journey together with patients undergoing THA/TKA, patients who have undergone THA/TKA, healthcare professionals, researchers and health tech companies. Previously, we have examined the needs of healthcare professionals (Jansson, Harjumaa, Puhto, & Pikkarainen, 2019) and patients (Jansson, Harjumaa, Puhto, & Pikkarainen, 2020), and modified and integrated the existing eHealth solutions to meet the needs of different stakeholders. In this secondary analysis, however, we concentrate only on the identified opportunities for gamification in the selected context in order to support patients' health-related behaviour through gameful experiences.

What does this paper contribute to the wider global community?

- Gamification provides an opportunity to increase engagement in a given health behaviour and, eventually, the possibility of reaching improved outcomes.
- This article provides important insight into the identified opportunities for gamification in the selected context in order to support patients' health-related behaviour.
- In addition, the results pinpoint the biggest opportunities for gamified services in the context of personalised counselling, monitoring and social support.

2 | BACKGROUND

During recent years, the use of technological solutions in the context of health and health care has been gaining more attention (Glanz, Rimer, & Viswanath, 2008; Johnson et al., 2016). For example, ubiquitous mobile and sensor technologies have enabled an unprecedented proliferation of technological solutions in the area. One of the major trends in health technology has been the use of gameful design for supporting health-related behaviours, that is health gamification (Johnson et al., 2016; Koivisto & Hamari, 2019; Seaborn & Fels, 2015).

The goal of the design approach of gamification is to provide similar experiences as games do in contexts that are not commonly considered to be game-like and, at the same time, to motivate the user of the gamified system towards certain behaviour (Huotari & Hamari, 2017; Högberg, Hamari, & Wästlund, 2019). Games are well-known for their ability to motivate and engage players to continue playing. Providing optimal challenges and the enjoyable experiences that arise from overcoming these challenges is at the core of games and their ability to engage (Deterding, 2015; Johnson et al., 2016). As indicated by goal-setting theory, having specific and challenging goals that one is committed to (such as the ones provided by games or gamification) increases related task performance (Locke & Latham, 2002, 2006). Moreover, well-designed games are known to support intrinsic motivation as a result of the satisfaction of the basic psychological needs of autonomy, competence and relatedness (Johnson et al., 2016; Rigby, 2014; Ryan, Rigby, & Przybylski, 2006). These experiences evoked by games have often been referred to as *gameful experiences* (Landers et al., 2018; Högberg et al., 2019).

Högberg et al. (2019) defined the gameful experience as including seven dimensions: *accomplishment*, *challenge*, *competition*, *guided*, *immersion*, *playfulness* and *social experience*. Högberg et al. (2019) defined these dimensions: *accomplishment* refers to the need to experience achievement and the sense of progress that arises from reaching set goals related to the behaviour targeted with the gamification; *challenge* refers to the experience of being challenged with the gamified behaviour—the behaviour requires increasing effort as one progresses; *competition* refers to experiences of rivalry towards others taking part in the same behaviour and engaged in the same gamified environment; *guided* refers to experiences of being guided through the behaviour—one knows what to do and how to proceed with the target behaviour or activities; *immersion* refers to being completely absorbed in the behaviour one is engaged in; *playfulness* refers to the experiences arising from voluntarily engaging

in enjoyable imagination- and exploration-driven behaviour; and finally, *social experience* refers to experiences arising from the perceived social presence of other individuals (real or virtual).

By supporting the emergence of these gameful experiences in the context of, for example health behaviour by employing gamification in the form of game elements and affordances, the motivational and engaging potential of games can possibly be harnessed for supporting this behaviour (Hamari & Koivisto, 2015; Högberg et al., 2019). When an individual is engaged in a given health behaviour and continues performing it, the intended health outcomes may eventually actualise. While some preliminary empirical research examining the relationships between the different dimensions of gameful experiences and actual game elements in gamified services has been conducted (Hassan, Xi, Gurkan, Koivisto, & Hamari, 2020; Sailer, Hense, Mayr, & Mandl, 2017; Xi & Hamari, 2019), the research is still in its infancy. Moreover, as gamification design is highly context-dependent—that is, the context of supported behaviour greatly affects what sort of interactions is perceived as motivating and engaging (Koivisto & Hamari, 2019)—research on how to support engagement and motivation through gameful experiences induced by game elements in different contexts is called for.

Our secondary analysis addresses this gap in previous literature by focusing on the gameful experiences in the lower-limb joint replacement journey. From the healthcare professionals' interviews, we identify opportunities for inducing the gameful experience dimensions of accomplishment, challenge, competition, guided, immersion, playfulness and social experience (Högberg et al., 2019) throughout the patient journey. Specifically, we identify opportunities for various game elements and affordances (as suggested by Koivisto & Hamari, 2019) to induce the above-mentioned gameful experiences. In addition, the quantified open codes within each category of game elements and affordances will be presented.

3 | METHODS

3.1 | Design

Our research team completed a secondary analysis of an interview data set consisting of semi-structured interviews with professionals involved in the care of THA/THA patients. The primary use of the interview data was to explore healthcare professionals' proposed eHealth needs in the selected context (Jansson et al., 2019).

3.2 | Setting and participants

Purposively sampled healthcare professionals were recruited from the single joint-replacement centre in Finland (Patton, 1990). Healthcare professionals who provide care for lower limb joint replacement surgery patients were recruited via e-mail and/or telephone by one of the authors. For a healthcare professional to be included in the study, they had to be an employee of the joint replacement centre, be involved in the care of THA/TKA patients, and be able to communicate in the Finnish language. Furthermore, they had to provide an informed consent for their participation. Two healthcare professionals dropped out prior to the interviews due to sudden illness (Jansson et al., 2019).

3.3 | Data collection

The data collection took place between 8 November 2018 and 7 December 2018. The interviews were conducted by the corresponding author, who is experienced in conducting research using the qualitative research approach and has working experience in surgical care (Jansson et al., 2019). Before the interviews, the corresponding author introduced herself and described the purpose of the study. Furthermore, the participants were informed that the interviews would be audio recorded and the collected data transcribed and pseudonymised (Jansson et al., 2019). It was also ensured that participation is fully voluntary and that the participants were able to withdraw from the study without justifications and that there would be no consequences from withdrawing. A signed informed consent form was collected from participants agreeing to take part in the study. Face-to-face interviews were conducted in private at the joint-replacement centre during the working shift. The healthcare professionals participating in the study were ensured that the interviewer is not a clinical staff member.

The semi-structured questions with prompts were prepared by the research team and framed by a topic guide, which was based on a literature review and the process mapping (Trebble, Hansi, Hydes, Smith, & Baker, 2010). The open-ended question was "Is there room for improvement in patient counselling?" After that, more specific questions were presented, such as "How could the digital patient journey solution be used to support patient counselling?"

To evaluate the level of the healthcare professionals' familiarity with and perception towards gameful solutions, they were asked about their playing behaviour ("Do you play games?") as well as about their personal playing orientation. The playing behaviour was asked about on the levels of digital, nondigital or gambling games, and in cases where the respondent had experience with a specific category, they were asked to elaborate what kind of games they play and the frequency of playing ("What games do you play and how often?").

The framework developed by Yee (2006) and Yee, Ducheneaut, and Nelson (2012) was used as a guide regarding the playing orientations as the interviewees were asked to rate how important they perceived the orientations of achievement, immersion and socialness for them when playing games ("How important is achievement/immersion/socializing in games for you?"). These questions were presented in a context-sensitive manner, for example if an interviewee had previously mentioned that they only play card games alone, they were not asked whether they consider immersion or socialness important when playing games.

The interviews took on average 41.2 min (Jansson et al., 2019). Drawing from the work of Malterud et al. (2016), the sample size

was evaluated continuously during the interviews, taking into account the information power. Finally, 20 interviews were carried out.

3.4 | Data analysis

The interviews were audio recorded, and the recordings were transcribed verbatim by a transcription service provider to ensure whole and accurate recording of each response. Furthermore, the transcripts were pseudonymised for the analyses. A deductive content analysis approach was used to analyse the collected data (Elo & Kyngäs, 2008). First, following the framework of Högberg et al. (2019), an unconstrained categorisation matrix was developed, and the data were coded according to the framework dimensions (the main categories). Second, the smaller coded data were grouped together as sub-categories, and the identified sub-categories were further grouped under the generic categories (Elo & Kyngäs, 2008). Subsequently, the identified sub-categories and generic categories were named using content-characteristic words, based on Koivisto and Hamari's (2019) predefined game elements and affordances. Finally, the identified generic categories were grouped under the predetermined main categories. Third, the occurrences of each open code within the categories were calculated and thus quantified. NVivo software was used for data analyzing (QRR International Pty Ltd., version 12).

3.5 | Rigor

Credibility was achieved through audio-recorded transcriptions. In addition, dependability was ensured through an audit trail. First, the corresponding author conducted an initial coding of the interview data. Then, the second PhD-qualified author reviewed the initial codings to ensure that all adequate information was coded. Thereafter, all groupings, categorisations and abstractions were jointly refined by both authors (Jansson et al., 2019). At last, in order to establish rigor, excerpts from the interviews in their original form were included in the study report. The methodology of the study—including selection of the sample as well as data analysis—was described in detail, and the study results were reported without commentary to ensure the transferability of the findings (Shenton, 2004). The reporting of the findings of the study follows the COREQ checklist (Tong, Sainsbury, & Craig, 2007) recommendations for studies conducted with qualitative methods (see File S1).

3.6 | Ethical considerations

The research conducted in this study has received approval from the relevant academic institution and has been reviewed in autumn 2018 by the local ethics committee (Decision No: 83/2018). Prior to the gathering of data, the study participants were thoroughly informed of the study aims and methods. Furthermore, all information was also provided to the participants via a standard written form. In accordance with the Declaration of Helsinki 2013, informed consent forms were collected from the participants prior to inclusion in the study to ensure that participation was voluntary. A data processing agreement was signed by all the researchers processing raw interview data.

4 | RESULTS

4.1 | Demographics

Most interviewees were women with an average age of 44.6 (Jansson et al., 2019). The participants consist of ten nurses, four physiotherapists, four surgeons, and two anaesthesiologists (N = 20).

4.1.1 | Playing behaviour

Of the total of 20 interviewees, two reported that they did not play any kind of game. Some types of digital game (e.g. puzzles and word games) were reported to be played by 15 interviewees, either on a smartphone, a tablet or a PC. The frequency of playing such games varied from daily play to playing occasionally or rarely. A few interviewees reported also playing other types of casual mobile games and console games, with a frequency ranging again from daily to occasionally or rarely. Nondigital games (e.g. board games, sudoku, crossword puzzles and playing with cards) were reported to be played by 17 interviewees. The frequency for nondigital game play varied from monthly play to playing occasionally or rarely. Furthermore, seven interviewees reported playing gambling games (e.g. lotteries and sports betting) or buying scratch cards. The frequency of participating in gambling games varied from weekly to occasionally.

4.1.2 | Playing orientation

Thirteen interviewees reported some level of achievement orientation regarding their playing behaviour. While only a few interviewees highlighted it as extremely important, most of the respondents considered it somewhat important to them. Immersion was clearly a less important playing orientation among the interviewees. Only six interviewees considered immersion as an important aspect of their playing. Of these, only three respondents characterised immersion as being very or quite important, for others immersion was only slightly important. The social aspects of playing were considered important by eight interviewees. Only two interviewees highlighted that the social aspects were very important to them, most of the respondents considered the socialness of playing to be only somewhat or very slightly important. As an interesting note, a few interviewees specifically highlighted how playing games is a form of relaxation and passing time for them.

TABLE 1 Examples of identified gamification opportunities (n = 20)

Main category	Generic category	Sub-category	Description	Frequency
Accomplishment				
	Clear goals		Clear overall and partial goals need to be defined prior to surgery in order to increase intrinsic motivation (e.g. the outcome of the surgery, timing of discharge and fulfilment of discharge criteria)	3
		Daily goals	Daily goals could be provided via a checklist of required action points with a checkbox to be ticked when actions are completed both prior and postsurgery in order to increase intrinsic motivation/goal orientation. The interface could indicate when daily goals are met For healthcare professionals: Daily nursing could be included regarding mobility and the removal of a urine catheter in order to enhance information transfer between healthcare professionals	9
		Weekly goals	Weekly goals could be provided for patients regarding weight loss, when needed	2
		Discharge goals	Clear and easily understandable discharge goals could be provided for patients to increase goal orientation, to engage the patient in self-care and to prevent hospitalisation	7
		Long-term goals	Long-term goals could be provided for patients related to mobility in different phases of the rehabilitation and to support both the execution of lifestyle changes well before the operation and the maintenance of these changes after surgery	4
	Activity tracking		Real-time tracking could be enabled prior to surgery for weight-loss monitoring in order to support reaching a preoperative weight goal. Activity tracking could be enabled related to mobilisation, medication (e.g. discontinuance of medications), control visits with a checkbox, and pedometer, and supported via both automatised instruction and reminders for patients. However, contraindications for application usage (e.g. with an immobilised patient)—as well as follow-up mobilisation, performance acknowledgment and competitive spirit when mobilising the patient postoperatively—need to be taken into account For healthcare professionals, prior surgery, the tracking of smoking cessation and weight management goals could be enabled. Notifications to healthcare professionals should be enabled once the preoperative weight target is achieved. The monitoring of mobility could be enabled and action points required from patients could be made visible. If the patient has not been mobilised in, for instance, 8 hr, healthcare professionals could remind him/her	19
		Diary	A diary could be provided for patients to monitor blood sugar and mobility (e.g. the number of exercises and repetitions per day, unexplored exercises) and to provide feedback on actions that has been taken as encouragement. In addition, the application could include visualisations of the actions taken For healthcare professionals, the diary could enable monitoring the patients' daily activities, mobility, the need for aids and medication	6
		Checklists	Pre- and postoperative checklists of scheduled, required action points (e.g. weight, monitoring co-morbidities, skin and oral health, aids, exercises, fasting, discontinuance of medications, mobilisation on the day of surgery, wound care and removal of stitches) could be provided for patients. Moreover, checklists could be integrated into a calendar view, and they could include a checkbox that can be ticked when an action is completed. A green light could light up on the completion of required actions. Completed actions could be shown in the healthcare professional's interface as well For healthcare professionals, pre- and postoperative checklists (e.g. eligibility criteria for surgery, mobilisation on the day of surgery and removal of a urine catheter) could be included to enhance the continuity of care between morning, evening and night shifts. The application could allow healthcare professionals to add exercise programs and specific exercises for the patient	29

(Continues)

TABLE 1 (Continued)

Main category	Generic category	Sub-category	Description	Frequency
		Notifications and reminders	Notifications could be included as frequent, short, scheduled (daily), chronological and even humorous reminders with audio for patients about the discontinuance of medications, fasting, walking aids, skin and oral health, symptoms of a serious condition that requires immediate medical attention, and the forms needed to be prefilled both 1–2 weeks and 1 day prior to surgery. In addition, in conjunction with reminders, contact details could be provided for additional questions For healthcare professionals, the possibility of assigning and notifying patients about personalised exercises during hospitalisation could be enabled. In addition, sending postoperative reminders to the patients regarding pain management and daily exercises could be enabled, alongside providing an additional communication channel to patients. It must be noted, however, that reminders can encourage some patients and discourage others Automatic reminders for the patient about additional investigations and treatments, and updates to the medication list (if appropriate) could be provided. Completed actions should be shown in the healthcare professional's interface	27
	Points and trophies		Awarding points and trophies could be enabled in order to communicate accomplishments such as mobilisation or the fulfilment of discharge goals. Points in the application could also be awarded for filling out feedback forms	3
Challenge				
	Increasing difficulty or an upward tendency		An upward tendency could be promoted by providing the first week's and following weeks' exercises (gradually increasing the difficulty in repetition and duration) to the patients. It has to be noted, however, that increasing difficulty may be problematic due to progressing pain. Completed actions should be shown in the healthcare professional's interface.	7
	Personalised challenges		Personalised challenges could be provided for tasks and exercises on the basis of background factors, taking into account different patient groups and characteristics (e.g. elderly, dysfunctional, chronic pain and immobile), correct and safe ways of performing exercises, and the continuity of care. Personalised, individually optimised goals could be included as challenges to help patient to progress.	8
Competition				
	Social comparison and competition		Social competition could be encouraged by sharing of accomplishments between patients in order to increase the motivation to reach discharge goals. Comparison, however, can lead to both positive and negative effects	5
Guided				

(Continues)

TABLE 1 (Continued)

Main category	Generic category	Sub-category	Description	Frequency
	Content of counselling		Counselling content could include relevant, digitalised (e.g. videos) and patient-centred information for patients about Healthcare Guarantee (e.g. the management of references, waiting times, the timing and placement of control visits, the average length of follow-up, contact details), health behaviour (e.g. providing information about nutrition as well as alcohol consumption and smoking in order to encourage cessation or reduction of usage and the benefits of an active lifestyle), preparation for surgery (e.g. how to get and use aids, getting out of bed, the discontinuance of medications, eligibility criteria for surgery [e.g. respiratory tract infections, gastro-intestinal infections and BMI], weight management, dental and skin care, hygiene, the ProviDextra® drink, laboratory tests and the bone bank), the surgery itself (e.g. risk calculator, the surgical technique and materials, anasthesia and analgesia), recovery (e.g. early mobilisation, movement restrictions, getting out of bed, length of stay, removal of stitches, wound care, anticoagulation, pain management), rehabilitation (e.g. joint friendly exercises), complications (e.g. infections, thrombolysis, joint dislocation, leg length discrepancy and need for revision) and sick leave	66
		Information input and provision	Prior to surgery, data could be collected from patients about previous surgeries, homecare (e.g. stairs inside/outside, stairs with or without handrail, living alone), medications (e.g. the dosage and timing of the medications taken, the discontinuance of medications, changes in medication), the duration of fasting, the contact details of each stakeholder, initial information (e.g. about a pacemaker, length and weight, co-morbidities, alcohol consumption, smoking, the Harris Hip Score, the Oxford Hip Score, daily activities, quality of life, the need for nitroglycerine and getting winded), therapeutic equilibrium (e.g. the level of blood sugar, blood pressure, pulse and haemoglobin), the range of motion (e.g. goniometry), preliminary questions, willingness to undergo joint replacement, previous use of aids and walking distances, and an acknowledgement regarding additional investigations and treatments. Postsurgery, data could be collected from patients about recovery (e.g. pain at rest and pain on movement, nausea) and wound healing. The possibility to send pictures and/or video clips about the wound, the exercise technique and regarding operability could be enabled. In addition, the application could help the patient acquire a new prescription when necessary	60
		Sensors	Information input from sensors (e.g. kinetic sensors and a pedometer) and remote monitoring could be enabled	4
	Implementation of counselling	Methods of counselling	The methods of counselling (e.g. digital materials, IT-based communication methods and remote visits) could include photograph and video clips for patients about the whole journey (including induction and anaesthesia), anticoagulation (e.g. Clexane injection instructions) and rehabilitation (e.g. movement restrictions, the use of walking aids and other aids, getting out of bed, encouragement to exercise prior to and postsurgery). In addition, the application could enable IT-based communication methods (e.g. chat, chatbots and text messages). Access to chat, however, should only be available when the frequently asked questions section does not provide an answer. In addition, an acknowledgement of message reception should be sent back to the sender. Remote visits (e.g. checking out skin health, range of motion and the successfulness of exercises) could be enabled	42
		Personalised counselling	Personalised couselling could be provided as instructions regarding cessation of smoking as well as weight loss when needed. All content should be meaningful to the patient. Personalised counselling for older adults with or without memory disorders, frailty, malnutrition or over-activity, as well as smokers and alcoholics, needs to be taken into account	6
		Patient-centredness	Patient-centredness could be supported by including need-based patient education instead of standard guidance. In addition, personal goals, expectations and interests should be harnessed in counselling. Video calls could be employed as a more patient-centred method of contact compared with phone calls	6

(Continues)

TABLE 1 (Continued)

Main category	Generic category	Sub-category	Description	Frequency
	Benefits of counselling	Engagement	Increasing patients' engagement in lifestyle change, rehabilitation, exercise, wound and pain treatment, and adherence to medication is needed. Engagement could be supported by enabling patient self-monitoring and encouraging commitment to lifestyle change. The engagement could be reinforced by reminders that would keep the patient in contact with the treating unit. In addition, clear goals would support engagement	5
	Performance feedback		Performance feedback could be collected anonymously for each specific phase or occupational group on the care journey. Collection should be scheduled for the same day or as close to the treatment event as possible. Queries should be short and voice notifications about available queries could be used. Digital queries could lower the threshold, facilitate feedback provision and enable rewarding healthcare professionals. Subjective evaluations of the benefits of the surgery would also beneficial	23
	Warnings		Warnings could be employed to preinform healthcare professionals about abnormalities in operability (e.g. anticoagulation, therapeutic equilibrium and skin conditions) in order to prevent cancellations	3
Playfulness				
	Ease of use		Ease of use should be facilitated, information and content should be provided in small amounts at a time and signing up should be easy	2
	Character		Characters could be utilised to depict the patient's progress on the surgery journey	1
	Game		Full games could be used for supporting smoking cessation and weight loss	3
	Audiovisual feedback		Audiovisual feedback could be provided as a reward for reaching goals (e.g. sounds and traffic lights). In addition, traffic lights could be employed to indicate if certain values are exceed/fall below a threshold or if there is an increased risk of infection etc.	7
	Bargaining		Bargaining could be utilised by only scheduling the surgery as a "reward" after proper preparation for surgery	7
	Visualisation		Visualisations could be enabled to indicate how close to the goal the patient is (e.g. how close they are to getting a referral). In addition, temporal trends (e.g. pain) could be visualised, as well as the effects of how a lifestyle change could affect the risks regarding surgery, death and infections based on risk score counters. The overall relationship between exercise, eating and medication (e.g. the level of blood sugar) could be visualised for the patient. For healthcare professionals, visualisations could be used for monitoring pain intensity, analgesic, weight and mobilisation pre-, intra-, and/or postoperatively as a segment, table or graph.	7
		Timeline	A timeline (or calendar view) could be provided to concretise a real-time surgery queue, remaining waiting time, the stage of referral processing, chronological care path steps (e.g. stitch removal) and sick leave. It must be noted, however, that having daily or even real-time information of the remaining waiting time can also cause stress.	13
Social experience				
	Encouragement		Encouragement could be harnessed by providing an alternative channel to motivate and remind patients daily throughout the surgical journey. Measurable goals and incentives regarding weight loss, smoking cessation, mobilisation, preoperative rehabilitation and joint-friendly exercise could be included as sources of encouragement.	9
	Virtual assistant		Virtual assistants could be employed to provide virtual encouragement/support in weight loss for the patient.	1

(Continues)

TABLE 1 (Continued)

Main category	Generic category	Sub-category	Description	Frequency
	Monitoring		Monitoring could be enabled for healthcare professionals to regarding the discontinuance of medications, weight loss goals, balancing underlying diseases, pain intensity and management, mobilisation and exercises, sleep, blood pressure and pulse, haemoglobin, nausea, blood glucose, fever and wound pre-, intra- and/or postoperatively. Digitally validated quality of life and performance surveys could be used to target/enhance control visits. Disease-specific quality registers would allow for long-term monitoring.	27
	Social networking			
		Peer support	Peer support could be enabled by a voluntary peer group, an open community where you can ask and answer questions from people at different stages of the journey.	3
		Support network	A support network could be enabled by integrating relatives and other networks into the digital patient journey solution.	2
		Professional support	Professional support could be supported by enabling restricted interaction with healthcare professionals in pre-, intra- and postoperative stages for the purposes of monitoring and guiding weight loss, rehabilitation, mobilisation, and recovery in order to motivate the patient and ensure the continuity of care.	10

4.2 | Gamification opportunities

Following the framework of Högberg et al. (2019), gamification opportunities were identified on six of the dimensions of the framework: *accomplishment*, *challenge*, *competition*, *guided*, *playfulness* and *social experience*. These issues reflected healthcare professionals' points of view during the pre-, intra- and postoperative phases of the THA/TKA surgery journey. The quantified open codes within each category are presented in Table 1.

4.2.1 | Accomplishment

The identified opportunities for gamification were related to clear goals (e.g. daily, weekly, discharge and long-term goals), activity tracking (e.g. diary, checklists, notifications and reminders), and points and trophies. Easily understandable, overall and partial goals need to be defined prior to surgery, and they could be provided via a checklist of the required action points, with a checkbox to be ticked when actions are completed. In addition, an interface of the developed digital patient journey solution could enable the integration of a scheduled checklist into a calendar view and a green light could light up whenever the required action is completed. The following quote from the interviews illustrates this view: "Of course, it would be good if, by the time all those particular things are checked, there would be a green light or something like that indicating that a certain set of criteria had been met" (surgeon). Completed actions could be shown in the healthcare professionals' interface as well.

Activity tracking could be enabled regarding, for example mobilisation and medication in order to signal progress towards set goals. Activity tracking could be enabled using diaries or checklists to follow activities and supported via automatised instructions and (chronological) notifications and reminders. For healthcare professionals, a diary could also enable monitoring patients' daily activities, mobility, the need of aids and medication.

Engagement in required actions could be supported via automatic, frequent, short, scheduled and even humorous reminders with audio. For instance, one interviewee noted that the solution could feature: "... frequent but short reminders with an alarm. And they could be humorous. In addition, some reward or a 'Well done' message about a required action" (nurse). For healthcare professionals, the possibility of assigning and notifying patients about personalised exercises during hospitalisation could be enabled. In addition, sending postoperative reminders to the patients regarding pain management and daily exercises could be enabled, alongside providing an additional communication channel to patients.

Awarding points and trophies could be enabled to communicate accomplishments, such as mobilisation or the fulfilment of discharge goals. It was stated in the interview that: "Could the patient maybe themself tick when the criterion has been filled? Or the therapist could do it and then show this to the patient? And when all the criteria are fulfiled, there would be some trophy because you are ready to be discharged" (physiotherapist).

4.2.2 | Challenge

The identified opportunities for gamification were related to increasing difficulty or an upward tendency and personalised challenges related to rehabilitation. The upward tendency in exercising could be supported by increasing difficulty gradually. For instance, one interviewee stated: "There should be the first exercises, and then there should be exercises starting after a week" (physiotherapist). In addition, individually optimised goals (e.g. personalised tasks and exercises) could be included as challenges to help the patient to progress.

4.2.3 | Competition

Regardless of age, the identified opportunities for gamification were related to social comparison and competition. Social competition could be encouraged by sharing accomplishments between patients. It was stated in the interview that: "It could include a checkbox to be ticked when actions are completed [...] Indeed, a bit of a competitive spirit often arises: 'now I want to go and do it too'" (surgeon).

4.2.4 | Guided

The identified opportunities for gamification were related to the content (e.g. information input and provision, sensors), implementation (e.g. methods of counselling, personalised counselling and patient-centredness) and benefits (e.g. engagement) of counselling, as well as performance feedback and warnings. Engagement in self-care could be enabled via self-monitoring and supported via reminders and clear goals. The following quote from the interviews illustrates this view: "The aim of the patient counselling is to engage the patients with their goals" (physiotherapist).

The quality of counselling could be supported via IT-based communication methods (e.g. chat, chatbots, text messages and remote visits) and supported via patient-centred information (e.g. personal goals, expectations and interests) and personalised, non-standardised, instructions and relevant digitalised content (e.g. Healthcare Guarantee, eligibility criteria, preparation for surgery, the general surgical journey, complications, rehabilitation and recovery). For instance, one interviewee noted: "if there are multiple channels that there are both paper-based and digital you could choose that which motivates you more. It could be that this kind of a device is what motivates you more and you would actually check the instructions from there" (physiotherapist).

Information input from patients could be enabled via patient-related outcome measures/queries, kinetic sensors, pedometers and remote monitoring. In addition, anonymous performance feedback could be enabled via short, properly timed queries and supported via voice notifications. Warnings could be employed to preinform healthcare professionals about abnormalities in operability.

4.2.5 | Playfulness

The identified opportunities for gamification were related to ease of use, character, full games, audiovisual feedback, bargaining and visualisation (e.g. of a timeline). Signing up should be easy, and information and content should be provided in small amounts of time. Characters could be utilised to depict the patients' progress on the surgery journey. Full games could be used for supporting smoking cessation and weight loss. One interviewee said: "It would be great if weight loss games could be included" (surgeon).

Rewarding could be enabled and supported via audiovisual feedback (e.g. sounds and traffic lights). In addition, traffic lights could be employed to indicate if certain values exceed/ fall below a threshold or if there is an increased risk of infection. Bargaining could be utilised by only scheduling surgery as a "reward" after proper preparation for surgery. Visualisation could be enabled and supported via a timeline, a calendar view, segments, tables and graphs.

4.2.6 | Social experience

The identified opportunities for gamification were related to encouragement, virtual assistants, monitoring and social networking (e.g. peer support, a support network and professional support). Encouragement could be harnessed by providing an alternative channel to motivate and remind patients daily throughout the surgical journey. Virtual assistants could be employed to provide virtual encouragement. In addition, remote monitoring could be enabled and supported via digitally validated quality-of-life and performance surveys, disease-specific quality registers and visualisations.

Social experience could be enabled and supported via a voluntary peer group and by integrating relatives and other networks into the developed digital patient journey solution. The following quote from the interviews illustrates this view: "Based on my experience, this sort of peer support forum would be in keeping with these modern times and very important." (nurse).

The professional support could be enabled by restricted interaction with healthcare professionals. It was stated in the interview that "there is some threshold [to contacting healthcare staff], so maybe with that application it could be made a little lower. It does anyhow provide some security; there is a certain continuity in the care—it does not end now if you walk out through that door and then you would have to come through the emergency department if you wanted to come back. It could surely be good for that" (nurse).

5 | DISCUSSION

Our secondary analysis addressed the gap in the existing literature by emphasising the identified opportunities for gamification

throughout the selected journey in order to support patients' health-related behaviour through gameful experiences. Following the framework of Högberg et al. (2019), gamification opportunities were identified on six experiential dimensions: *accomplishment*, *challenge*, *competition*, *guided*, *playfulness* and *social experience*. Based on the frequencies of the coded content, from the healthcare professionals' perspective, the biggest opportunities for gamification can be identified in the context of personalised counselling, monitoring and social support. In addition, we identified opportunities for various game elements and affordances to induce the above-mentioned gameful experiences.

5.1 | Gamification opportunities

The identified opportunities for gamification regarding accomplishment were related to clear goals, activity tracking, and awarding points and trophies. According to the interviews, easily understandable overall and partial goals need to be defined prior to surgery in order to increase intrinsic motivation, goal orientation, engagement in self-care; to prevent hospitalisation; and to ensure the continuity of care between shifts and healthcare professionals. Furthermore, activity tracking would enable tracking the progress towards the goals (e.g. discharge goals and rehabilitation goals). As reported by Koivisto and Hamari (2019), clear tasks and goals are some of the most common elements and affordances implemented in gamified systems, along with elements indicating the completion of provided tasks or reaching goals, such as points, achievement badges or trophies, and progress bars. All of these elements and affordances are directed towards creating experiences of achievement and accomplishment and can be supported by goal-setting theory (Tondello, Premsukh, & Nacke, 2018). In addition, activity tracking could be enabled and supported via automatised instructions and reminders to create engagement. Prior research on gamified health behaviour support systems has indicated that, for example reminders by a short text messages are beneficial in engaging the patients in the desired behaviour (Allam, Kostova, Nakamoto, & Schulz, 2015; Gremaud et al., 2018; Thorsteinsen, Vittersø, & Svendsen, 2014). These findings suggest that reminders delivered via an app could also be beneficial for increasing engagement. However, contraindications for activity tracking need to be considered. Furthermore, according to the interviews, the reminders can encourage some patients and discourage others, which highlight the need for including personalisation possibilities when designing gamified solutions in the given context.

The identified opportunities for gamification regarding the dimension of challenge were related to increasing difficulty or an upward tendency and personalised challenges. Rehabilitation processes commonly proceed progressively. Therefore, it provides an intuitive opportunity for gameful interaction in the form of the increasing difficulty of the tasks and goals provided as the patient proceeds on their journey (Koivisto & Hamari, 2019; Tondello et al., 2018). According to the interviews, the intensity of pain has been associated with increased motivation to commit to a lifestyle change. However, increasing difficulty or an upward tendency may be problematic due to progressing pain. Therefore, gamification design, adapting to specific user needs (Högberg et al., 2019), is recommended.

The identified opportunities for gamification regarding competition were related to social comparison and competition. According to the interviews, however, the comparison can lead to both positive and negative effects. While competition is a common aspect in gamified services (Koivisto & Hamari, 2019), research suggests that it does not always lead to positive outcomes, especially in health contexts. A study by Chen and Pu (2014) on exercise gamification indicated that participants increased their exercise behaviour more when cooperating with other participants, instead of competing against them. As indicated by prior research and the data of the current study, competition should be implemented with caution in the context of health gamification.

The identified opportunities for gamification regarding the experience of feeling guided were related to the quality of patient counselling, performance feedback and warnings. According to the interviews, video calls and digital patient journey solutions were considered more patient-centred and motivating methods than traditional phone call and paper-based counselling. In addition, personalised counselling for older adults with or without restrictions (e.g. memory disorders and immobilized patient) needs to be taken into account. Gamified systems commonly build on the idea of providing guidance in the behaviour supported by the gamification; the next steps are either explicitly presented to the user or implicitly hinted by the goals and instructions provided by the system (Högberg et al., 2019; Tondello et al., 2018). Therefore, gamification could be considered a useful approach to supporting counselling. There is, however, a lack of studies evaluating the effectiveness of gamification in patient counselling (unpublished data). Furthermore, it is unknown how patient-centred counselling could be supported through gamification.

The identified opportunities for gamification regarding playfulness were related to ease of use, characters, full games, audiovisual feedback, bargaining and visualisations. Playful interactions, for example in the form of full games, have been found to support health-related behaviour change and to provide various health benefits to users of varied ages (Baranowski, Buday, Thompson, & Baranowski, 2008; Hall, Chavarria, Maneeratana, Chaney, & Bernhardt, 2012). For example, according to the interviews electronic questionnaires would be useful for lowering the threshold for providing (positive or negative) feedback and thus would increase response rates throughout the THA/TKA patient journey.

The identified opportunities for gamification regarding social support were related to encouragement, virtual assistants, monitoring and social networking. Prior research on gamified health behaviour support systems has indicated that social support can have a positive effect on, for example self-management of one's condition (Allam et al., 2015) or on continued use of a system (Hamari & Koivisto, 2015). For instance, screening and the preoperative physical optimisation of risk patients have been combined with a motivational conversation to reduce unintentional patient paths in patients with fast-track THA/TKA (Hansen et al., 2012).

As highlighted in the interviews, the patient is eventually accountable for his or her actions or lack of actions. As gamification is often implemented in order to support, for example experiences of accomplishment and competence, as well as one's agency over behaviour (Högberg et al., 2019; Rigby, 2014), it could provide a suitable tool for reminding the patient about their accountability as well as positively increasing the willingness to self-manage the parts of the care journey that are the patient's responsibility.

5.2 | Strengths, limitations and trustworthiness

Some restrictions need to be considered when evaluating the findings of the study. First of all, this is a single-centre study. Therefore, the results may not be transferable to dissimilar populations. Second, our study was a secondary analysis and the questions were not pilot tested. In addition, opportunities for immersion were not identified. Third, participants did not review the transcripts. However, because the transcripts were transcribed verbatim from the audio recordings, they can be considered reliable sources of information. Despite the above-mentioned limitations, the findings of this study provide important insights into the identified opportunities for gamification to support health-related behaviour through gameful experiences and pinpoint the biggest opportunities for gamified services in the context of personalised counselling, monitoring and social support.

6 | CONCLUSION

In conclusion, several opportunities for gamification were identified and quantified based on healthcare professionals' views of the current state of the elective fast-track THA/TKA journey. Based on the analysis of the interview data, opportunities for gamification were identified related to supporting the experiential dimensions of accomplishment, challenge, competition, being guided, playfulness and social experience, with the biggest opportunities considered to be found in the context of personalised counselling, monitoring and social support. While various needs and limitations need to be considered when developing digital gamified solutions for THA/TKA patients and more research into the effectiveness of such solutions will be required, the current study opens possible future avenues for exploring the use of gamification in lower limb joint replacement journey and other specialisms.

7 | RELEVANCE TO CLINICAL PRACTICE

This secondary analysis provides important insights into healthcare professionals' views of the current state of the THA/TKA arthroplasty journey and the potential for its development. In addition, it provides important insights into the identified opportunities for gamification in the selected context in order to support patients' health-related behaviour through gameful experiences, and it pinpoints the biggest opportunities for gamified services in the context of personalised counselling, monitoring and social support. Despite the focus of this secondary analysis being on the THA/TKA journey, the findings can also be generalised to other surgical journeys.

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CONFLICT OF INTEREST

The authors have no conflict of interest.

AUTHORS' CONTRIBUTIONS

All authors conceived the idea and initiated the project. MMJ collected the data. MMJ and JK performed the analysis. All authors participated in the interpretation of the results and critically reviewed the manuscript. All authors read and approved the final manuscript.

CONSENT FOR PUBLICATION

All consents to publish from the participants who took part in this study were obtained.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the relevant academic centre, and it was reviewed by the *Ethics Committee* of Northern Ostrobothnia Hospital District, *Oulu University Hospital*, Oulu, Finland, during the autumn of 2018 (Decision No: 83/2018). To determine the method of the study was explained to the participants, and they were also informed by a standard written information form. Written informed consent was obtained from participants prior to inclusion in the study to ensure that the participation was voluntary (Declaration of Helsinki 2013).

DATA AVAILABILITY STATEMENT

The data sets generated and analysed are not publicly available. Data sets are available from the authors on reasonable request and with permission from the relevant academic centre.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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